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ABSTRACT

This brief paper presents a summary of a study which examined the developmental progression of categorization and its relationship to language development in 12 adults with severe to profound mental retardation and with less than 100 words of expressive language (including manual signs). Subjects were asked to sort physically eight miniature objects consisting of four objects from each of two categories. Perceptual similarity and inclusiveness were manipulated as five contrasts had perceptually identically category members and five had perceptually non-identical category members. Receptive and expressive understanding of object labels was also assessed. The study found that only perceptual similarity influenced categorization. Nine subjects were able to sort categories with identical members, an ability associated with the onset of naming in typically developing infants and toddlers. Level of inclusiveness did not influence categorization and there was no relationship between the number of categories sorted and any of the language measures. (Contains 15 references and 4 tables.) (DB)

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# Categorization in Adults with Severe to Profound Mental Retardation.

Pamela F. Lewis

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## Categorization in adults with severe to profound mental retardation

The development of categorization and its relationship to language development are important issues that should be explored in atypical populations for both theoretical (e.g., converging support for proposed sequences of development) and applied (e.g., intervention) reasons.

In typically developing infants and toddlers the development of categorization skills has been linked to the level of inclusiveness of the category, i.e., basic ("car"), global or superordinate ("vehicle"), and subordinate ("convertible") levels. Researchers do not agree, however, as to the developmental primacy of these levels (Mandler and McDonough, 1993; Rosch, 1978). More recently, researchers have linked the developmental progression of categorization skills to similarity of category members (Madole and Oakes, 1999).

Regarding the relationship of language and categorization, several researchers have found a positive link between between vocabulary size and categorization skills in typically developing infants and toddlers (e.g., Gopnik and Meltzoff, 1987, 1992).

The present study examined the developmental progression of categorization and its relationship to language development, in adults with severe to profound mental retardation.

## Method

Participants were 12 adults with severe to profound mental retardation who had no more than 100 words of expressive language (including manual signs). An object manipulation technique was employed. Each participant handled 10 category contrasts, each consisting of four miniature objects from each of two categories, with all eight objects presented simultaneously. The dependent measure was the number of categories they sorted (physically placed together).

To study the development of categorization, perceptual similarity and level of

inclusiveness were manipulated. Thus five of the contrasts had perceptually identical (i.e., highly similar) category members, and five had perceptually non-identical category members. The category contrasts included basic and global levels. Because this was an exploratory study, there were also two "nonlinguistic" contrasts. See Table 1.

To study the relationship of categorization skills and vocabulary, participants looked at pictures of objects from the same categories used in the categorization task, and were tested on receptive and expressive understanding of the object labels. In addition, a familiar caregiver completed a receptive and expressive vocabulary checklist.

## Results

Nine of the 12 participants sorted one or more categories. They sorted categories with identical members more frequently than those with non-identical members, $t(11) = 3.58$, $p<.01$, 2-tailed (t-test for correlated groups). They sorted global and basic level categories with equal frequency, $t(11) = 0.00$, n.s., 2-tailed (t-test for correlated groups).

There was no relationship between the number of categories sorted and any of the language measures: receptive vocabulary task ($r = .21$, n.s.), expressive vocabulary task ($r = .03$, n.s.), receptive vocabulary inventory ($r = .05$, n.s.), expressive vocabulary inventory ($r = .01$, n.s.).

## Discussion

For these participants with mental retardation, only perceptual similarity influenced categorization. Nine of twelve were able to sort categories with identical members, an ability that is associated with the onset of the naming explosion in typically developing infants and toddlers (Gopnik and Meltzoff, 1987, 1992). The implications of this finding for this population, as well as for the development of categorization generally, need to be explored.

**Categorization in adults with severe to profound mental retardation**

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Biennial meetings of the Society for Research in Child Development- Minneapolis, Minnesota
April 20, 2001

## THE QUESTIONS

1) What is the relationship of thought to language?

2) What are the universals of development?

* * * * *

Categorization is a basic cognitive process.

Universals bridge atypical and typical populations.

Therefore, <u>two more specific questions</u> are:

1) How do categories develop?

in atypical as well as typical populations

2) What is the relationship of category development to language development?

in atypical as well as typical populations

In this study, I asked:

1a) What factors affect categorization in adults who are nonverbal due to mental retardation?

1b) Are these factors the same as for typically developing infants?

2a) Is there a relationship between categorization skills and language development in adults who are nonverbal due to mental retardation?

2b) Is this relationship the same as for typically developing infants?

## IMPORTANCE of RESEARCH with ADULTS with SEVERE to PROFOUND MENTAL RETARDATION

Theory

1) To better understand universals of development, by identifying constants across populations.
2) To better understand developmental processes, through observed differences across populations.

For example, two nonverbal populations are:

1. prelinguistic infants
2. some adults with severe to profound mental retardation

Very little is known about how the cognitive development of these two groups compares. The number of studies on adults with severe to profound mental retardation is disproportionaely low, even given their small percentage of the total population (approximately .1%). A recent literature search yielded no hits at all.

Intervention

Approximately 275,000 in the U.S. are at this level of mental retardation.

Vocational and residential programs would benefit from intervention programs which could be developed with greater knowledge.

## BACKGROUND

How categories develop

In typically developing infants, categorization has been linked to:

1. level of inclusiveness of the category (Mandler and Bauer, 1988; Mandler, Bauer, and McDonough, 1991; Mandler and McDonough, 1993; Poulin-Dubois, Graham and Sippola, 1995; Rosch, 1978).
2. physical similarity of category members (Madole and Oakes, 1999; Oakes, Coppage, and Dingel, 1997; Quinn, Eimas and Rosenkrantz, 1993)

Relationship of language development to category development

In typically developing infants and toddlers:

A positive link has been found between categorization skills and vocabulary development (e.g., Gopnik and Meltzoff, 1987, 1992; Mervis and Bertrand, 1994; Poulin-Dubois, Graham, and Sippola, 1995; Shore, Dixon, and Bauer, 1995).

In atypical populations:

Children with Williams syndrome show a vocabulary spurt without categorization (Mervis and Bertrand, 1993).

Children with mental retardation, and autism showed no link between receptive language and categorization (Ungerer and Sigman, 1987).

## METHOD

Participants

--12 adults with severe to profound mental retardation from a large midwestern congregate living facility

-- 1 had an additional dx of Autistic Disorder.

--Level of language development was measured with a language task administered by the E, and a language survey filled out by a familiar caregiver. Each had no more than 100 words of expressive language (including manual signs). Most had far fewer.

--Ages of all but two ranged from 18-42 years, with one who was 79 years old and one who was 63.

See Table 1.

Stimuli

Miniature objects from global and basic level categories, as well as "nonlinguistic" categories of geometric shapes (clothespins, blocks, rectangular sponges, round lids), and a category contrast of airplanes and winged animals.

See Table 2, and Figure 1.

Procedure

*Categorization*

1) 10 trials were presented, each consisting of a category contrast.
2) On each trial, 8 objects were presented in a row, 4 from each of two categories, with the items from each category alternating with each other
3) Each trial lasted 2 minutes.
4) Participants were urged to "fix them up," or "what can you do with all of these?"
5) The entire procedure was videotaped for later scoring.
6) Sorting by category was the dependent measure (the members of at least one of the two categories in that contrast had to be placed clearly separate from the others).

*Choice of dependent measure*

Unlike typically developing infants and toddlers, these adults with severe to profound mental retardation tended to exhibit little behavior. They required frequent urging to touch the objects and praise after doing so each time. There were not a sufficient number of touches to use a sequential touching paradigm (e.g., Starkey, 1981; Sugarman, 1981), however sorting into groups occurred relatively often, hence the choice of dependent measure.

*Language*

*Inventory*: Caregivers were given a vocabulary inventory similar to the MCDI (1993).

*Task*: 1) Pictures of objects from the same categories as the categorization task were presented 3 at a time.
2) Participants were asked to name each, and then were requested to touch each one as it was named.
3) The procedure was videotaped for later scoring.

Receptive and expressive vocabulary sizes were obtained from the inventory and from the language task.

## RESULTS

Only perceptual similarity influenced categorization. Participants sorted categories with identical members more frequently than those with non-identical members, $t(11) = 3.58$, $p < .01$, 2-tailed (t-test for correlated groups). See Table 3.

Level of inclusiveness did not influence categorization. Participants sorted global and basic level categories with equal frequency, $t(11) = 0.00$, n.s., 2-tailed (t-test for correlated groups). See Table 3.

There was no relationship between the number of categories sorted and any of the language measures: receptive vocabulary task ($r = .21$, n.s.), expressive vocabulary task ($r = .03$, n.s.), receptive vocabulary inventory ($r = .05$, n.s.), expressive vocabulary inventory ($r = .01$, n.s.). Additional analyses were done with only nominals, which are a subset of total vocabulary. No relationship was found between number of categories sorted and either receptive nominals ($r = -.11$, n.s.) or expressive nominals ($r = .00$, n.s.). See Table 4.

## DISCUSSION

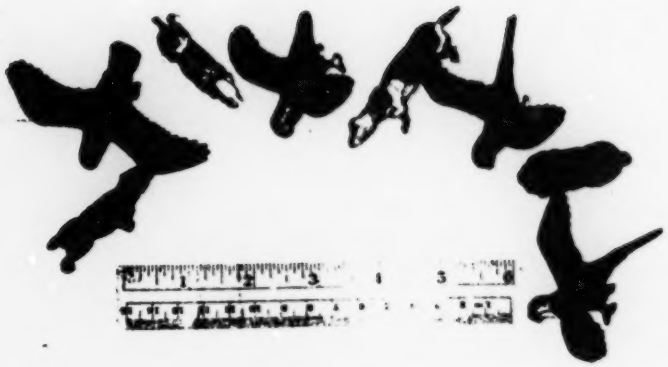
1. demonstration of a viable procedure for studying categorization in this population
2. support for similarity as more important than level of inclusiveness in the development of categories
3. lack of support for connection between language development and categorization
4. possibly no longer a connection once categorization and language skills are no longer developing
5. are these skills still developing in this population?

Figure 1

Sample Category Contrasts

Identical Nonlinguistic

Nonidentical Basic



Nonidentical Global

**Table 1: Participant characteristics**

| Participant # and age | Diagnosis | Receptive task: # identified (of 27) | Expressive task: # identified (of 27) | Receptive vocabulary size by inventory | Expressive vocabulary size by inventory |
|---|---|---|---|---|---|
| 1 29 yr. | severe-profound | 1 | 0 | 57 | 12 |
| 2 23 yr. | profound | 4 | 0 | 87 | 13 |
| 3 79 yr. | severe | 0 | 0 | 37 | 71 |
| 4 63 yr. | severe | 0 | 1 | 269 | 4 |
| 5 25 yr. | severe | 23 | 0 | 224 | 43 |
| 6 24 yr. | profound | 3 | 0 | 340 | 4 |
| 7 28 yr. | profound | 22 | 0 | 116 | 19 |
| 8 42 yr. | severe | 2 | 0 | 57 | 1 |
| 9 39 yr. | profound | 9 | 0 | 224 | 37 |
| 10 26 yr. | severe; autism | 27 | 0 | 295 | 17 |
| 11 18 yr. | profound | 27 | 0 | 358 | 19 |
| 12 41 yr. | profound | 1 | 0 | 0 | 0 |

**Table 2: Characteristics of Categories Used**

| Objects | Category level | Identical members? |
|---|---|---|
| sponges/caps | nonlinguistic | yes |
| blocks/ clothespins | nonlinguistic | yes |
| cars/trucks | basic | yes |
| cars/trucks | basic | no |
| dogs/birds | basic | yes |
| dogs/birds | basic | no |
| furniture/vehicles | global | no |
| winged animals/airplanes | global | no |
| food/people | global | no |
| girls/cookies | global | yes |

**Table 3: Number of Categories Grouped, by Type**

| Partici-pant Number | Identical mem-bers (of 5 sets) | Non-identical members (of 5 sets) | Basic (of 4 sets) | Global (of 4 sets) | Non-linguis-tic (of 2 sets) | Total # of categories sorted (of 10 sets) |
|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 | 0 | 1 | 1 |
| 4 | 2 | 0 | 0 | 0 | 2 | 2 |
| 5 | 2 | 0 | 0 | 1 | 1 | 2 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 5 | 1 | 3 | 1 | 2 | 6 |
| 8 | 5 | 0 | 2 | 1 | 2 | 5 |
| 9 | 3 | 0 | 1 | 1 | 1 | 3 |
| 10 | 1 | 0 | 0 | 0 | 1 | 1 |
| 11 | 1 | 0 | 0 | 1 | 0 | 1 |
| 12 | 1 | 0 | 0 | 1 | 0 | 1 |

**Table 4: Vocabulary, Nominals, and Total Number of Categories Sorted**

| Participant # | Receptive vocabulary: inventory | Expressive vocabulary: inventory | Receptive nominals: inventory | Expressive nominals: inventory | Receptive vocabulary: task (of 27) | Expressive vocabulary: task (of 27) | Total categories sorted (of 10 sets) |
|---|---|---|---|---|---|---|---|
| 1 | 57 | 12 | 35 | 1 | 1 | 0 | 0 |
| 2 | 87 | 13 | 55 | 3 | 4 | 0 | 0 |
| 3 | 37 | 71 | 31 | 56 | 0 | 0 | 1 |
| 4 | 269 | 4 | 166 | 0 | 0 | 1 | 2 |
| 5 | 224 | 43 | 165 | 38 | 23 | 0 | 2 |
| 6 | 340 | 4 | 218 | 4 | 3 | 0 | 0 |
| 7 | 116 | 19 | 100 | 10 | 22 | 0 | 6 |
| 8 | 57 | 1 | 38 | 2 | 2 | 0 | 5 |
| 9 | 224 | 37 | 140 | 18 | 9 | 0 | 3 |
| 10 | 295 | 17 | 195 | 8 | 27 | 0 | 1 |
| 11 | 358 | 19 | 236 | 10 | 27 | 0 | 1 |
| 12 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |

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